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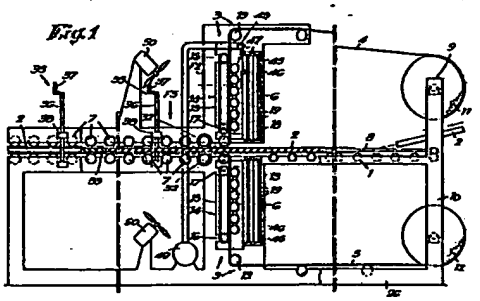
(71) Applicant: POLYSIERTEGELS, Naamloze Vennootschap
Tallaart 37
B-2578 Koningshooikt (BE)

(72) Inventor: Wouters, Lucas Jean Jozef
Wolvenstraat 14
B-2860 O.L.V. Waver (St. Kat. Waver) (BE)

(74) Representative: Donné, Eddy
Bureau M.F.J. Bockstael nv Arenbergstraat 13
B-2000 Antwerpen (BE)

(54) Procedure for coating elements consisting in expanded plastic, and devices applied for it.

(57) Procedure for the coating of elements consisting in expanded plastic, characterized in that it consists in the heating up of a layer of coating material (4, 5) formed of non expanded plastic and the pressing against the element to be coated (2) of the heated layer (4, 5), in such way that by melting together at their cooperating surfaces a permanent attachment is obtained after cooling.
The device applied for this purpose provides in the rolling of the coating against the elements to be coated.



EP 0 332 602 A2

Description

Procedure for coating elements consisting in expanded plastic, and devices applied for it.

Present invention concerns a procedure for coating elements consisting in expanded plastic, also named foam plastic, as well as a device to carry out this procedure according to the invention.

As known, expanded plastic, such as for instance polystyrene, polyethylene and other similar materials, are obtained in various applications. Examples of it can be found in great numbers in the insulation technology, the packaging industry and in the decoration techniques.

That objects and elements produced in expanded plastic are quite vulnerable, show little strength and are difficult to clean due to their porous properties is a known fact.

Present invention aims at a procedure for coating elements in expanded plastic, in such way that the produced products do not have aforementioned disadvantages any more. In this way, a tougher plastic layer is applied to the surface of the elements in expanded plastic and in such a manner that, between the coating material layer and the element to be coated, a solid, practically unbreakable, connection is created.

The products obtained according to the invention thus also have the advantage that they are sturdier that those products which are not provided with aforementioned coating. The strength reveals itself primarily by a substantial surface hardness, an increased breaking strength and an improved portative power. This, in turn, shows the advantage that the obtained products enjoy a longer lifespan.

Present invention also aims at a procedure in which the application of the layer of coating material on the element to be coated occurs in such way that the constantly appearing grain shaped structure of the expanded plastic does not or seldom show in the applied layer of coating material, due to which latter remains smooth, with the advantage that the obtained products are easier to be wet cleaned and that dirt does not adhere to such an extent to the coating's surface.

The procedure according to the invention has, moreover, the advantage that the elements in expanded plastic can be provided with a coating of any colour.

Finally, it is to be noted that the inventions aims as well at increasing the number of applications in expanded plastic, or so-called foam plastic. Other aims and advantages will appear from further descriptions.

Present invention concerns a procedure as well for the coating of elements which consist in expanded plastic, characterized in that this procedure mainly consists in the heating of a layer of coating material formed of a non expanded plastic and to press the heated layer against the element to be coated, in such way that, by the melting together of their cooperating surfaces, a permanent connection is obtained after cooling.

More particularly, present invention aims herewith at the coating of stratified elements, such as sheets and similar. An additional aims consists in that the coating of such sheets can be achieved efficiently by means of a continuous process. In a particular embodiment, the pressing of a layer of coating material against the element to be coated occurs by bringing the heated layer by means of a continuously progressing movement in contact with one or more elements in expanded plastic to be coated. More so, according to the invention, the heated layer is being rolled on these elements, which offers the special advantage that finished products with a very smooth surface are obtained in which the grain shaped structure of the expanded material on its exterior surface becomes virtually invisible. In order to provide for a continuous process, the layer of coating material is herewith being taken from a reel, while the expanded elements consist in sheets which are being supplied in sequence.

According to a well defined embodiment the sheets are being coated on both sides by applying aforementioned method, which offers the advantage that the finished product, according to present invention as well, can be separated in any length, regardless of the locations in which the used sheets of expanded material connect with one another.

In a particular adaptation of the invention, the applied layer or coating material is being chosen wider than the elements, respectively sheets, to be coated, and the coating material is being folded over the edges of the sheets to be coated while it is still hot, in such way that the finished product obtains a finished appearance as well as shockproof edges.

According to a variant in the procedure according to the invention, wooden strips are being provided at the edges of the sheets to be coated during aforementioned continuous process, in such way that the layer of coating material is being bent over these and that strips are affixed.

Present invention shows the advantage that such products may be manufactured rapidly in large quantities.

In all aforementioned embodiments, the layer of coating material will preferably be heated until softening, whereupon it immediately is pressed against the element, for instance a sheet, to be coated. As a material for the elements to be coated one will preferably choose an expanded plastic within the types of insulation material, more particularly materials such as expanded polystyrene, expanded polyethylene or similar expanded materials. Moreover, preference is given that the same basic material for the layer of coating material as that in which the element to be coated is made of be chosen, thus with the only difference that the element to be coated consists in the plastic in expanded form, while the layer of coating material consists in the same plastic in a non expanded state.

Present invention also concerns a device for the coating of elements made of expanded plastic, more particularly for the coating of sheets, according to aforementioned procedure.

In order to better show the characteristics of the invention a preferred embodiment of such a device is described hereafter as an example with reference to the attached drawings, in which :

Figure 1 shows the device according to the invention schematically ;

figure 2 shows, at a larger scale, the part which is indicated by F2 in figure 1 ;

figures 3 and 4 show cross sections, respectively according to lines III-III and IV-IV, in figure 2 ;

figure 5 shows a view according to arrow F5 in figure 1 ;

figure 6 shows a cross section according to line VI-VI in figure 5 ;

figures 7 and 8 show cross sections, respectively according to lines VII-VII and VIII-VIII in figure 6;

figure 9 schematically shows a rear view of the device in figure 1 ;

figure 10 shows the connection diagram of the electric heating elements ;

figure 11 shows a cutting device which can be used together with the device according to figure 1 ;

figures 12 and 13 show views according to arrow F12 in figure 11 for two different positions ;

figure 14 schematically shows a variant of a device according to the invention ;

figure 15 shows a particular product obtained according to the procedure of the invention ;

figure 16 shows a part of a device, as it can be used in combination with the device in figure 1, particularly for the sawing off of the edges of the product according to figure 15.

The device according to the invention mainly consists in a track 1, preferably a roller track, for the supply of elements in expanded plastic, primarily sheets 2 ; means 3 to supply one or more layers of coating material, respectively 4 and 5 ; heating means 6 for the respective heating up of aforementioned layers 4 and 5 ; rollers 7 to press the heated layer of coating material 4-5 against sheets 2 by rolling and driving means which will be further described hereafter. Even though a device is shown in figure 1 in which, at both sides of sheet 2, a layer of coating material is applied; it is obvious that the procedure can be carried out with one layer 4 or 5 only, in such way that a variant of the device according to the invention can also exclusively consist in the upper or lower part of the machine represented in figure 1.

The sheets supply track 1 is preferably equipped with guides 8 adjustable in width.

The means 3 for the supply of layers 4-5 mainly consist in reel supports 9 and 10 on which reels 11 and 12 with the concerned coating material can be placed, a number of folding cylinders 13 and driven guiding means 14. Each of these guiding means 14 consists, as shown in figures 1 through 4, mainly in a continuous chain 15 which is guided over two sprocket wheels 16 and 17, in which sprocket wheel 17 is mounted on a driven shaft 18, and free rotating sprocket wheels 19 which are being pushed towards the free parts of the chain 15 by means of tensioning means 20. Such guiding means 14 are placed at both edges of layers 4 and 5 in such way that the layers are guided between chain 5 and the free rotating sprocket wheels 19, be clamped between them and transported along the heating means 6 by the chain's 15 movement. The sprocket wheels 19 press the layers 4-5 locally in the apertures of the chain links in the chains 15.

As shown in the detailed drawings according to figures 2 and 3, the tensioning means 20 mainly consist in universal joints 21 which, on the one hand, are installed on a fixed frame section 22 and which, on the other hand, carry a movable frame section 23 on which the free rotating sprocket wheels 19 are installed, as well as in draw springs 24 which provide the required stretching force.

The complete device is preferably provided with width adjusting means in such way that sheets and coating materials of different widths can be processed. As shown in figure 3, the aforementioned frame sections 22 and 23 are slidable and adjustable in a support 25 which is linked with the machine frame 26 as such. The sprocket wheels 16 and 17 are also freely sliding along their shafts 18 and 27 and are carried along by the movement of the frame section 23 by means of a fork 28, as shown in figure 4.

Aforementioned driving means for the transport of the formed finished product is factually being formed by a number of aforementioned rollers 7, more particularly these rolls which, as shown in figures 5 and 6, are power driven, for instance by means of a circular chain 29 which drives said rollers 7 via sprocket wheels 30 and which in turn is being driven by means of a driven shaft 31. It is evident that a similar construction is provided for on the lower as well as on the upper parts.

The first rollers 7, between which the sheets 2 and layers 4 and 5 are guided, do not only act as rollers but as folding cylinder as well. On one of the following cylinder pairs, preferably at both edges of each roller, a folding ring or folding flange 32 is provided in order to fold the layers of coating material 4-5 over the edges of the sheets 2, as shown in figure 7, obviously when required for the finished product. Furthermore, guides, such as wooden strips 33, are preferably provided for, with which the folded parts 34 are being pressed for some time contacting the edges of sheets 2, until the layer of coating material 4, respectively 5, has sufficiently cooled down and is firmly attached to the base sheet 2. The excess material of parts 34 is cut away later on.

As can be seen in figures 1 and 8, the upper and lower part of the device, respectively, are movable with respect to one another by means of lifting devices 35, for instance formed by a screw spindle 36, provided with a crank 37 in which, on the one hand, the lower extremity of the screw spindle 36 rests freely on the frame of the lower part of the device and, on the other hand, in which this screw spindle 36 passes through a threaded mounting 38 at the upper part of the device. In this way sheets 2 of different thicknesses can be processed, for

instance, as from one half of a centimeter through one half of a meter.

As shown in figure 9 aforementioned driven shafts 18 and 31, as well as chains 15 and 29, are driven by means of a chain 39 which in turn is driven by an electric motor 40. A gear 42 movable along a guide 41 allows for chain 39 to be adjusted with respect to the adjustment of the lifting devices 35.

As schematically shown in figure 10, the heating means 6 preferably consist in multiple, broadwise arranged rows of infrared lamps 43 situated next to one another, which are connected individually or in groups with adjusting devices 44 for the admission of electric power, in such way that the desired temperatures, in layers 4 and 5 can be maintained. It is evident that a smaller loss of heat occurs at the centre of the embodiment, where consequently less power has to be fed to the interior rows 43 than to the outer rows. Behind the heating means 6 a reflector 45 is preferably located, while a removable protection sheet 46 can be provided for it. As shown in figures 1 and 10, between the upper heating means 6 and the concerned layer of coating material 4, air 47 is preferably blown in, towards the bottom, in order to achieve an uniform spread of heat. This could be for instance achieved by means of a perforated pipe 48 which is connected with a compressor 49.

The first rollers 7 are preferably cooled by means of blowing devices 50, such as fans, in order to avoid that they would reach a high temperature after some time, through which layers 4 and 5 would stick to these rollers 7.

The embodiment according to the invention is preferably equipped, at the side where the formed finished product 51 leaves, as shown in figure 11, with an almost automatically operating cutting device 52, with which the finished product 51, regardless of the locations 53 where the sheets 2 join, can be separated in desired lengths L.

The cutting device 52 mainly consists in a frame 55, rolling over guides 54, which by means of an adjustable stop 56 and by means of the arriving product 51 can be moved in the direction of movement of latter and moving it in opposite direction by means of a weight 58 suspended to a pulley 57, which always forces the frame 55 into one direction by means of a cable 59, opposite to the movement of the product 51.

The factual cutting means consist in a filament 60, for instance connected with a battery 61, in which this filament 60 is installed in a frame 62, moving up and down, in the frame 55. In the initial position according to figure 11, the frame 62 is maintained in its highest position by means of stops 63 consisting in a support 64 connected with the frame 62 which rests by means of a small roller 65 or similar on a fixed stop 66.

The cutting device's 52 operation can be easily deduced from the drawing and consists in that the product 51 slides through the frame 55 until it meets the stop 56. From that moment on, frame 55 is carried along by the movement of the product 51 and the support 64 is released from the stop 66, in which frame 62 with the filament 60 falls onto the finished product 51 which melts, while frame 55 and product 51 continue their movement. When the product 51 is cut through, a sheet with a length L is produced which then has to be removed. The operator pulls the frame 55 a bit forward and pushes frame 62 with the filament 60 back up. Frame 62 will then hook onto an elastically movable stop 67, as shown in figure 12, in which, for instance, aforementioned support 64 hooks on. When the frame 55 is then released, it will roll back under the influence of the weight 58 to its initial position, in which the movable stop 67 is being pushed aside by means of a permanent stop 68, in such way as shown in figure 13, in which the support 64 together with the roller 65 will drop onto aforementioned stop 66. The dropping movement of the frame 62 can be limited by providing for a counterweight 69, in which the filament will land on the product 51 to be cut in a smooth downward movement.

As shown in figure 14, the heating means 6 can, as well as the guiding means 14, not shown in this drawing, be located in such way that they provide for an inclined movement of layers 4 and/or 5, in which latter are being bent less sharply and substantially thick layers 4 and 5 can be applied, which in this case can be supplied either from reels 9 and 10 or in the form of sheets.

Figure 15 represents the product discussed in the introduction, in which at both edges of the sheets 2 wooden strips 70 are added, which in the aforementioned continuous process can be supplied to the machine together with sheets 2. Strips 70 are kept in location because the coating layers 4 and 5 are bent around these strips. It is evident that, in this case, automatic sawing machines 71 are placed at the discharging end of the embodiment, in such way as shown in figure 16. These sawing machines 71 will then saw off strips 70 whereupon the plastic parts can be cut afterward by means of, for instance, aforementioned filament 60.

Present invention is in no way limited to the embodiment described as an example and represented in the drawings, but such a procedure and installation for coating elements consisting in expanded plastic can be realized in all kinds of variants without leaving the scope of the invention.

Claims

1.- Procedure for coating elements consisting in expanded plastic, characterized in that it consists in the heating up of a layer of coating material (4, 5) formed in a non expanded plastic and the pressing against the element to be coated (2) of the hot layer (4, 5), in such way that by the melting together of there cooperating surfaces a permanent attachment is obtained after cooling.

2.- Procedure according to claim 1, characterized in that the pressing of the layer of coating material (4, 5), against the element (2) to be coated occurs in joining the heated layer (4, 5) in a forward movement with the element to be coated (2).

3.- Procedure according to claim 1 or 2, characterized in that the heated layer of coating material (4, 5) is being rolled onto the surface of the element to be coated.

4.- Procedure according to one of the aforementioned claims, characterized in that as material of the element to be coated (2) or elements to be coated (2) an expanded plastic is chosen within the types of insulation materials, more particularly materials such as expanded polystyrene, expanded polyethylene or similar materials and that as layer of coating material (4, 5) the same basic material is chosen as the material in which aforementioned element (2) consists, but in its non expanded form.

5.- Procedure according to one of aforementioned claims, more particularly for the forming of coated sheets, characterized in that the procedure is performed in a continuous process in which the element to be coated is formed by the succession of multiple sheets (2) in expanded plastic, and in which the layer pressed against it, respectively layers of coating material (4-5) are being taken from a reel, respectively reels (9-10).

6.- Procedure according to one of the aforementioned claims, characterized in that aforementioned elements (2) are being coated at both sides according to aforementioned procedure.

7.- Procedure according to claims 5 or 6, characterized in that the coating material (4-5) is being folded over the edges of the sheets (2) to be coated.

8.- Procedure according to one of the claims 5 through 7, characterized in that during a continuous supply of sheets (2) wooden strips (70) are being supplied at the same time, in such way that the coating material (4, 5) is being folded over them.

9.- Procedure according to one of the claims 5 through 8, characterized in that the formed product (51) is being separated in lengths (L) chosen at random regardless of the locations (53) where the sheets (2) in expanded plastic join together.

10.- Device for the realization of the procedure according to one of aforementioned claims, characterized in that it mainly consists in a track (1) to supply sheets (2) ; means (3) for the supply of at least one layer of coating material (4, 5) ; heating devices (6) provided per applied layer (4, 5) to heat the coating material to a desired temperature ; rollers (7) to press the coating material against the sheets (2) ; and driving means to move the formed product forward.

11.- Device according to claim 10, characterized in that it consists in an upper and lower part which are mainly constructed symmetrically to one another and which each provide in the supply of a heated layer of coating material (4, 5), which are simultaneously pressed on both sides of the supplied sheets (2).

12.- Device according to claim 11 or 12, characterized in that each of the means (3) to supply a layer of coating material (4, 5) mainly consist in, on the one hand, a reel support (9, 10) to receive a reel (11, 12) of the concerned coating material and, on the other hand, in guiding means (14) which transport the concerned layer (4, 5) along the aforementioned heating devices (6), in which these guiding means (14) are mainly formed by, along both edges of the supplied layer of coating material (4, 5), driven chains (15) as well as gears (19) which are forced towards the chains (15) by means of tensioning means (20), in which the concerned layer (4, 5) between chains (15) and gears (19) is being moved.

13.- Device according to claim 11, characterized in that the driving means mainly consist in a number of aforementioned rollers (7) which are driven by means of an electric motor (40).

14.- Device according to one of the claims 11, 12 or 13, characterized in that the heating devices (6) mainly consist in multiple rows of infrared lamps (43) which are spread over the width, equipped with adjusting means (44) which allow for applying different temperatures along the width of the device.

15.- Device according to one of the claims 11 through 14, characterized in that the device is equipped with blowing means (50) for the cooling of at least one of the rollers (7) with which the layers of coating material (4, 5) enter into contact.

16.- Device according to one of the claims 11 through 15, characterized in that at least one of the rollers (7) is equipped with folding rings (32) in order to fold the concerned layer of coating material (4, 5) over the edge of the sheets and that in the movement of said product guiding means (33) are provided behind these folding rings (32) which press the folded parts (34) during a certain time against the element to be coated.

17.- Device according to one of the claims 11 through 16, characterized in that the layers of coating material (4, 5) are supplied to the sheets at an angle with respect to the sheets to be coated (2).

18.- Device according to one of the claims 11 through 17, characterized in that it is equipped with a cutting machine (52) which mainly consists in a frame (55), movable by means of the movement of the finished product (51) against the force of a return weight (58) ; a stop (56) connected with the frame (55) to adjust the dimension of the lengths to be cut ; and a filament (60) movable up and down, by means of a frame (62) in the frame (55), which is, in the starting position of the frame (55), kept in its upper position by means of stopping means (63) and is released during the movement of the frame (55) of these stopping means (63) in which the filament (60) contacts the finished product (51) laying underneath.

19.- Device according to one of the claims 11 through 18, characterized in that is provided

with sawing machines (71) at the side on which the coated elements (2) leave the device, at least for partially sawing through the concerned product (51).

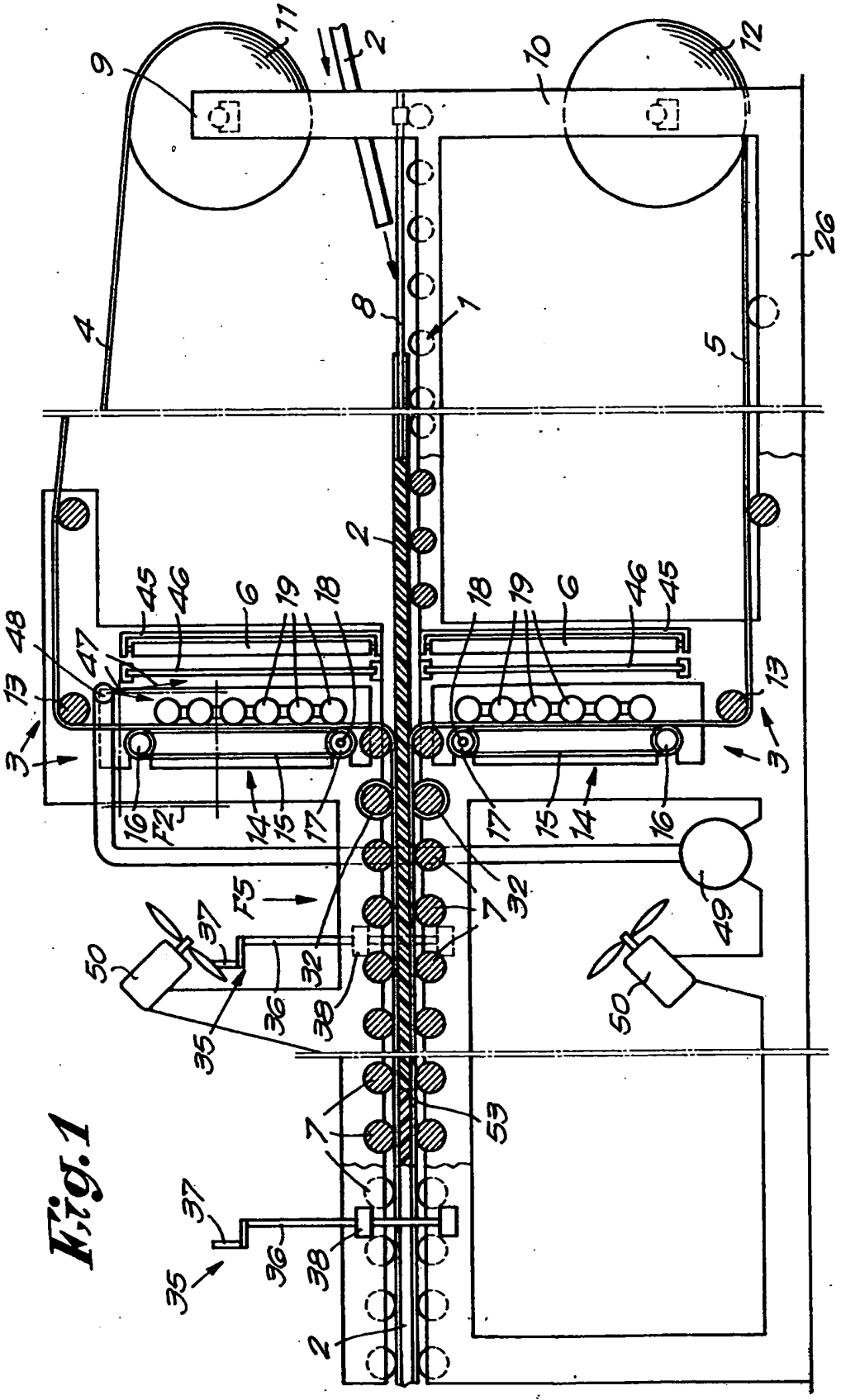

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Fig. 1

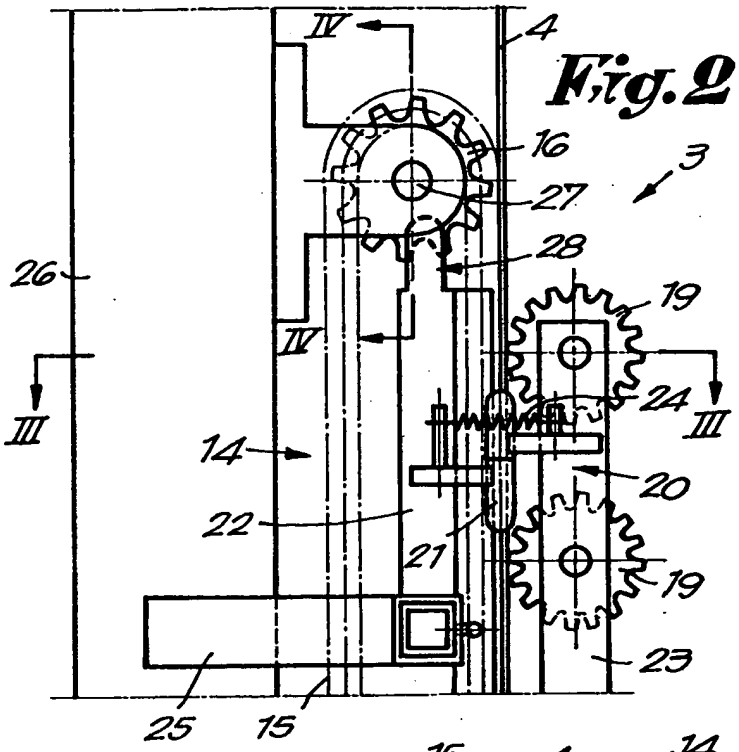

Fig.2

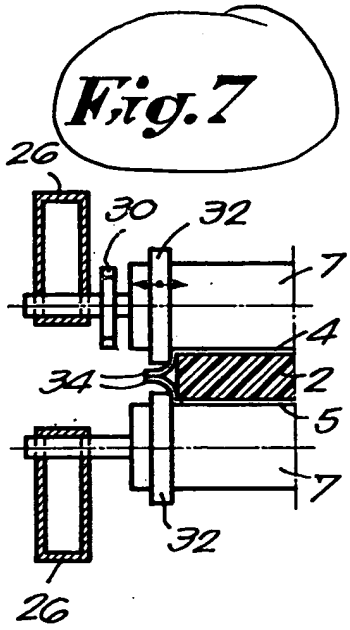

Fig.7

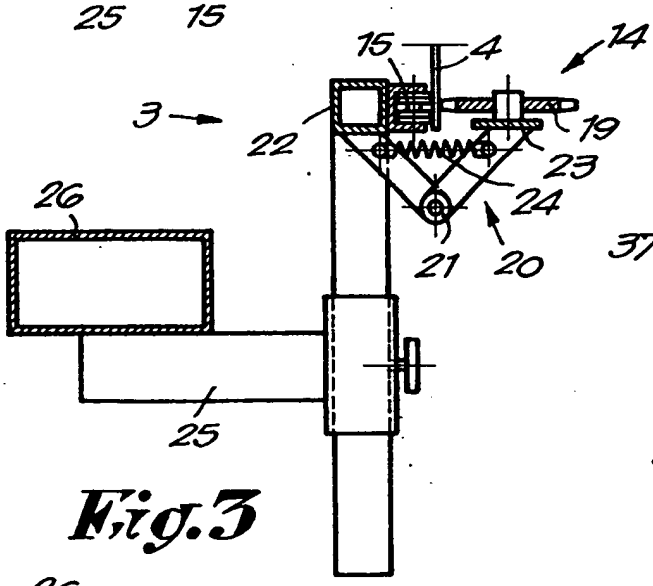

Fig.3

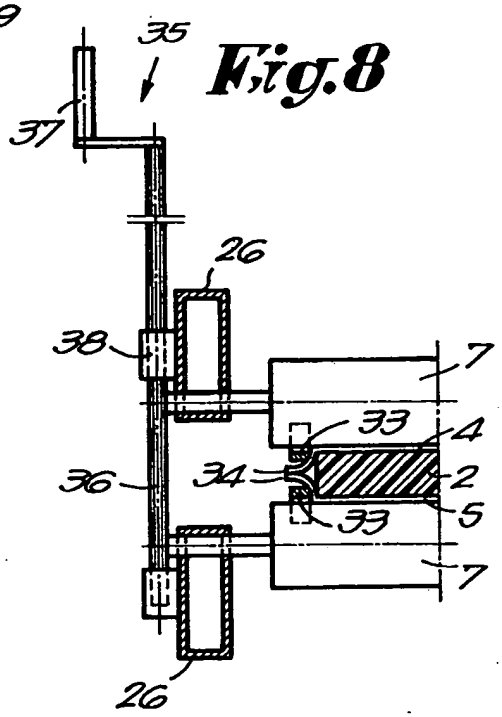

Fig.8

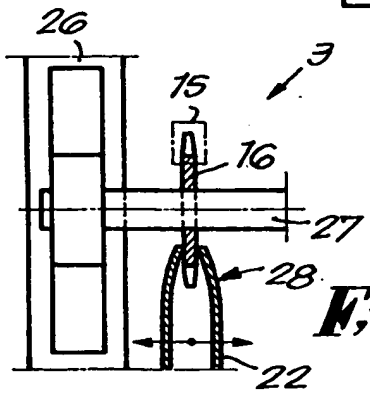

Fig.4

Fig.5

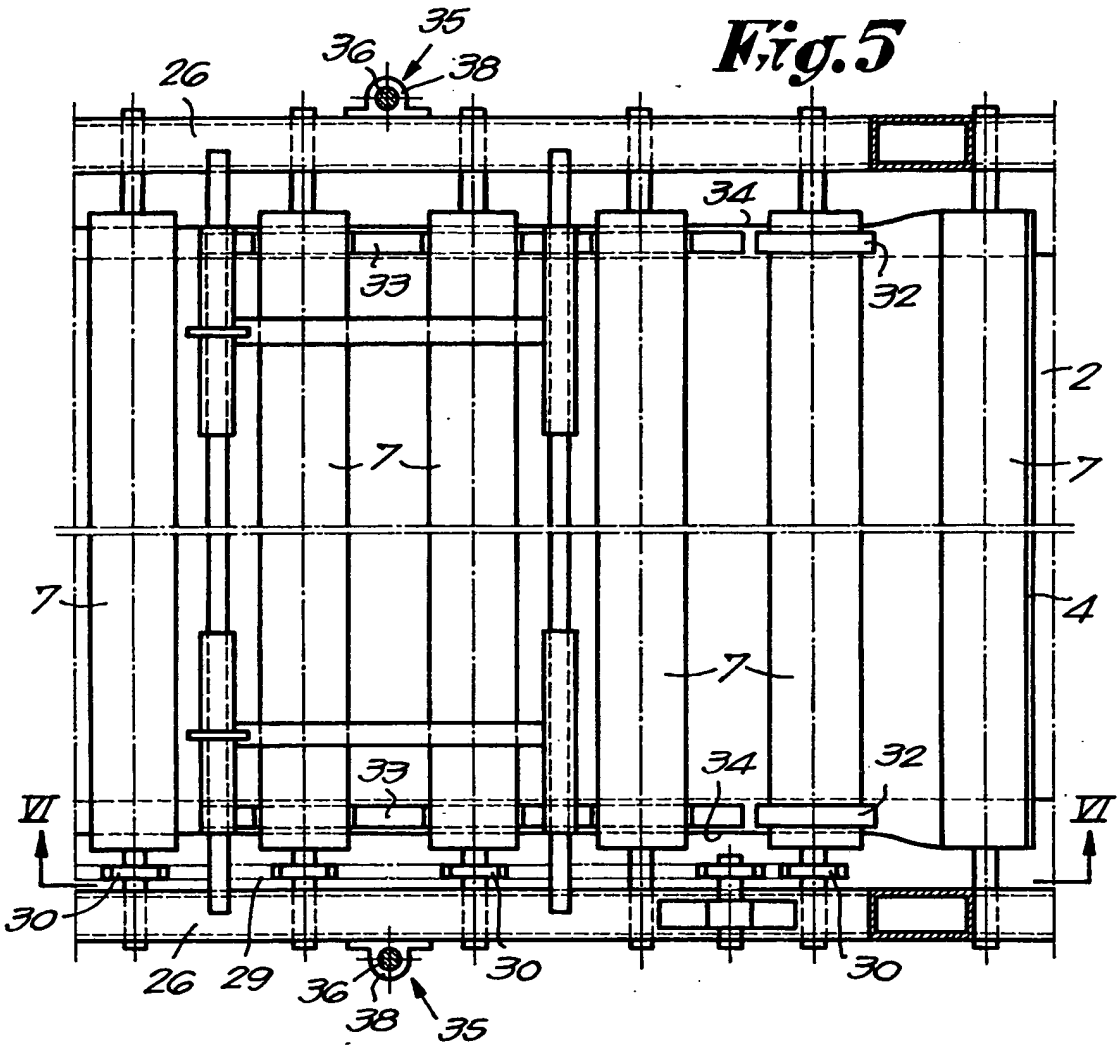
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Fig.6

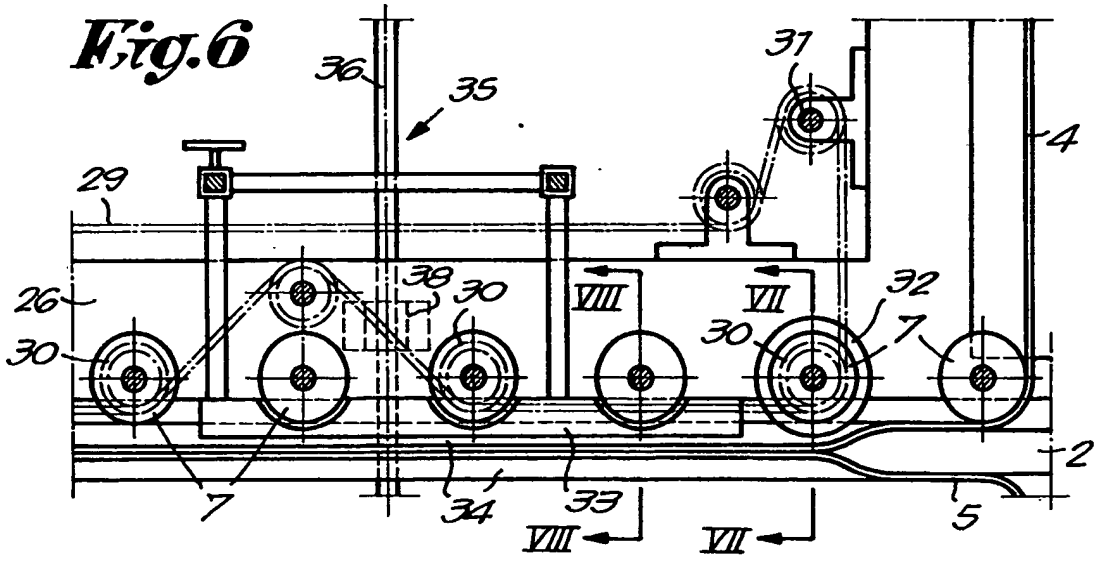
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Fig.9

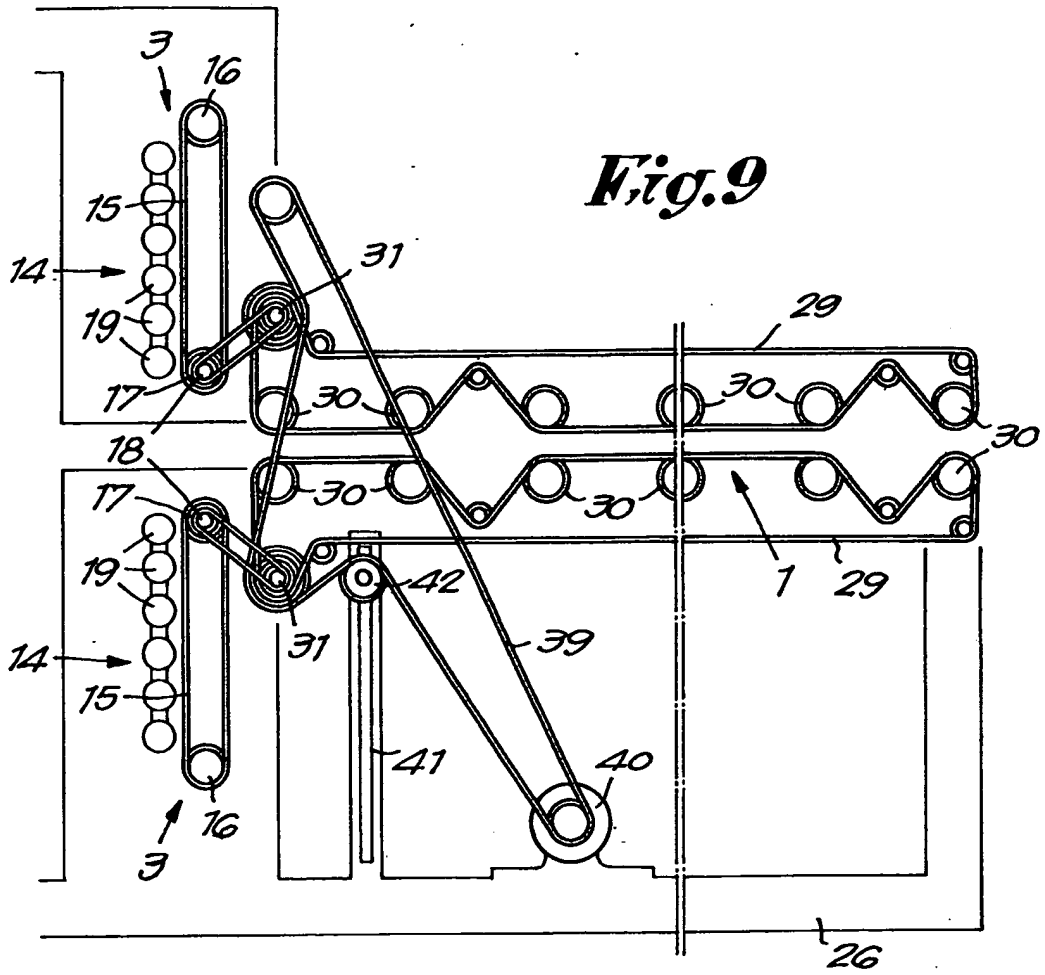


Fig.12

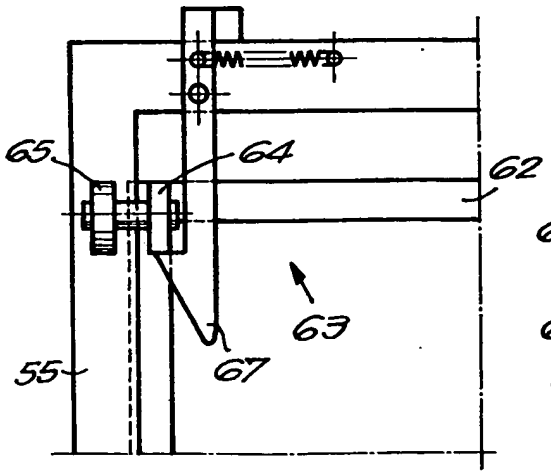
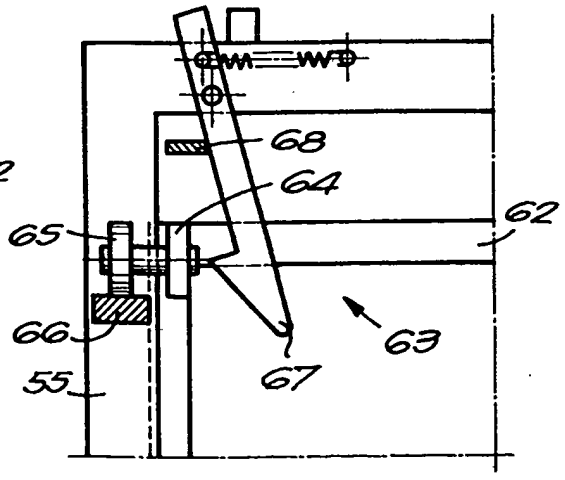


Fig.13



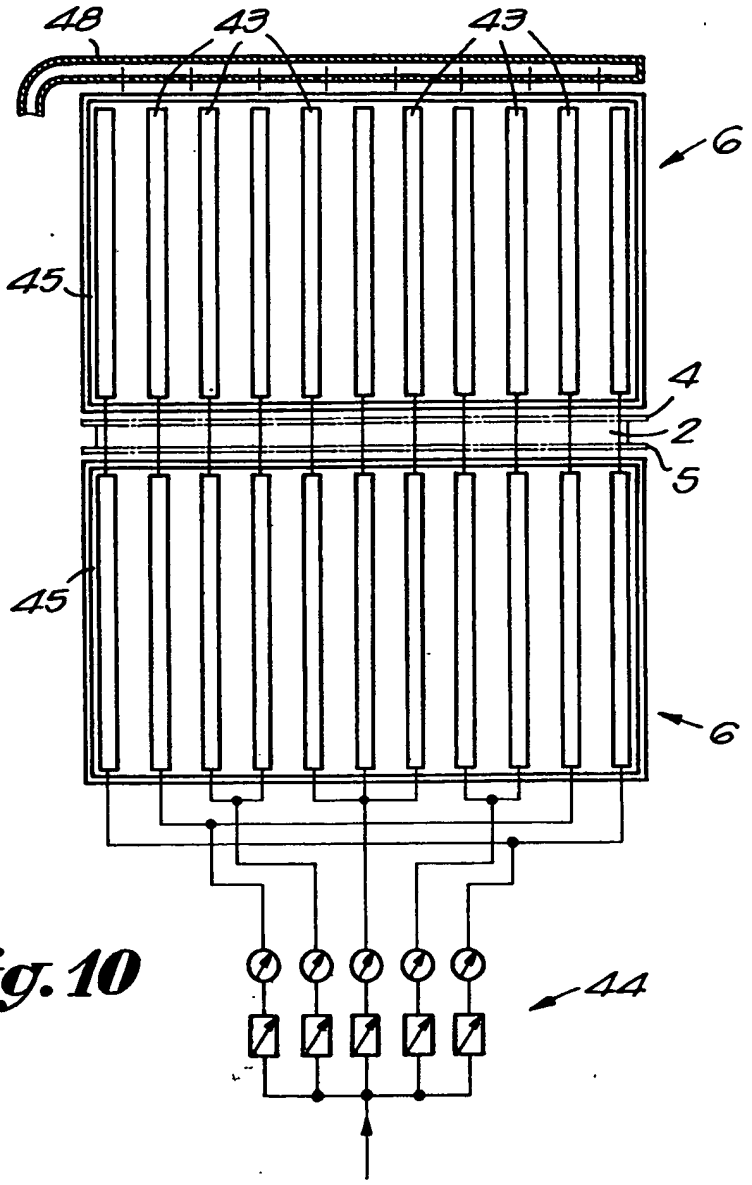
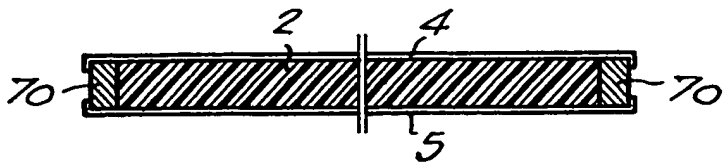


Fig. 10

Fig. 15



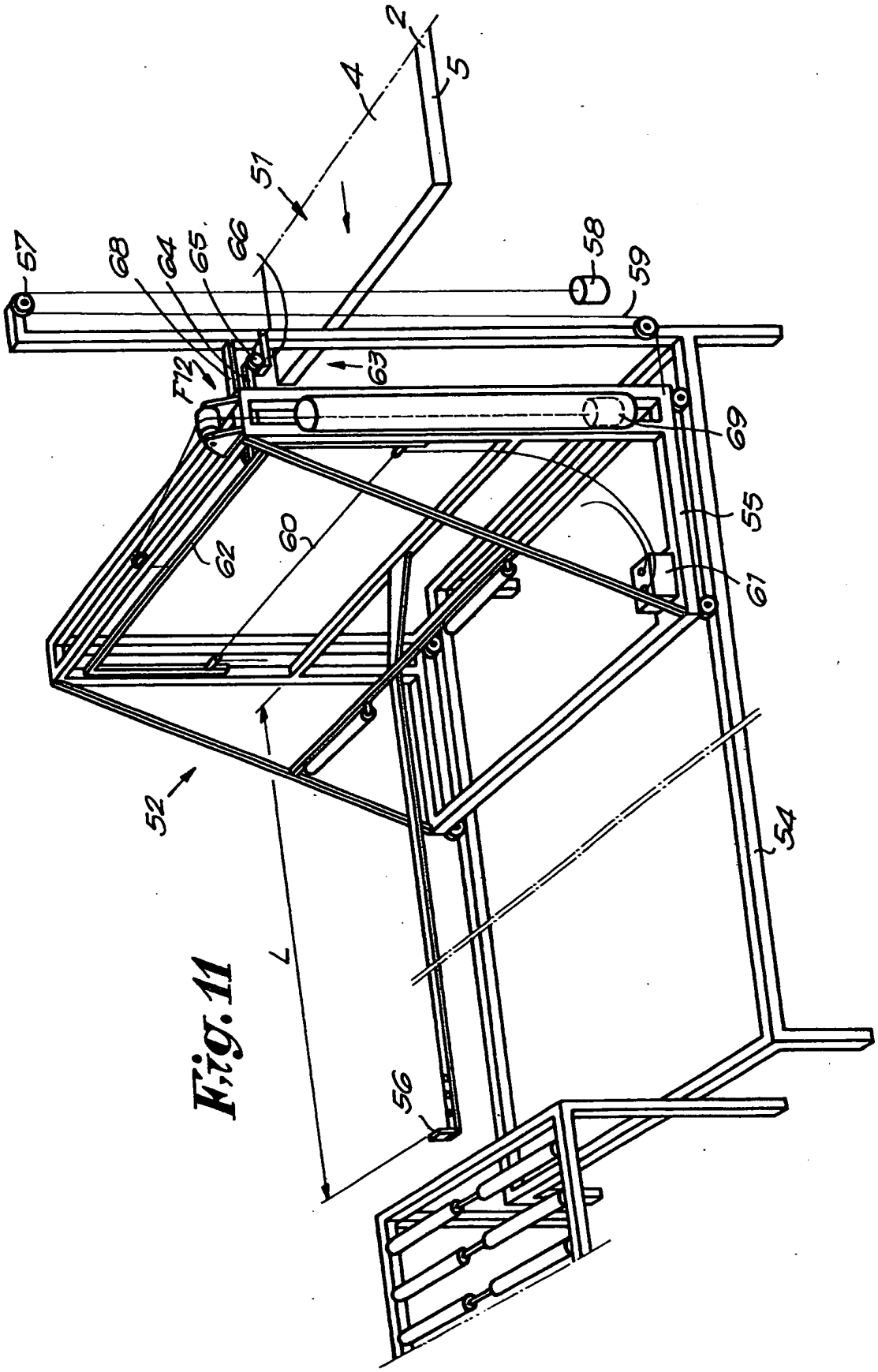


Fig. 11

Fig.14

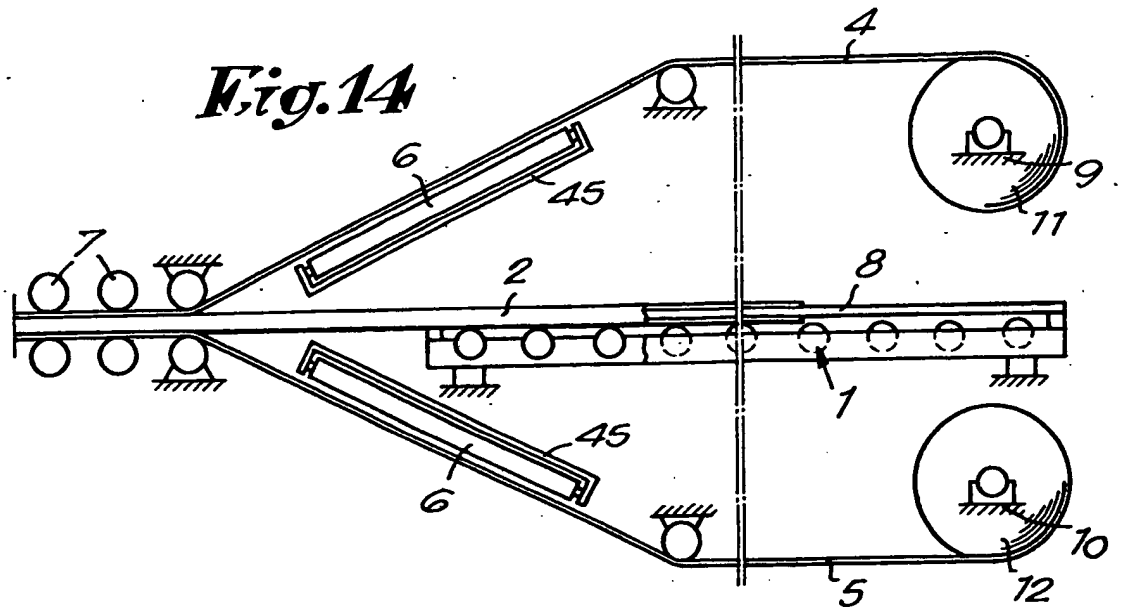


Fig.16